

Newcastle disease virus strain AF2240 as an oncolytic virus: a review

ABSTRACT

The discovery of tumour selective virus-mediated apoptosis marked the birth of an alternative cancer treatment in the form of oncolytic viruses. Even though, its oncolytic efficiency was demonstrated more than 50 years ago, safety concerns which resulted from mild to lethal side effects hampered the progress of oncolytic virus research. Since the classical oncolytic virus studies rely heavily on its natural oncolytic ability, virus manipulation was limited, thereby, restricted efforts to improve its safety. In order to circumvent such restriction, experiments involving non-human viruses such as the avian Newcastle disease virus (NDV) was conducted using cultured cells, animal models and human subjects. The corresponding reports on its significant tumour cytotoxicity along with impressive safety profile initiated immense research interest in the field of oncolytic NDV. The varying degree of oncolytic efficiency and virulency among NDV strains encouraged researchers from all around the world to experiment with their respective local NDV isolates in order to develop an oncolytic virus with desirable characteristics. Such desirable features include high tumour-killing ability, selectivity and low systemic cytotoxicity. The Malaysian field outbreak isolate, NDV strain AF2240, also currently, receives significant research attention. Apart from its high cytotoxicity against tumour cells, this strain also provided fundamental insight into NDV-mediated apoptosis mechanism which involves Bax protein recruitment as well as death receptor engagement. Studies on its ability to selectively induce apoptosis in tumour cells also resulted in a proposed p38 MAPK/NF- κ B/I κ B α pathway. The immunogenicity of AF2240 was also investigated through PBMC stimulation and macrophage infection. In addition, the enhanced oncolytic ability of this strain under hypoxic condition signifies its dynamic tumour tropism. This review is aimed to introduce and discuss the aforementioned details of the oncolytic AF2240 strain along with its current challenges which outlines the future research direction of this virus.

Keyword: AF2240; Apoptosis; NDV; Newcastle disease virus; Oncolytic virus